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ABSTRACT

The relationship was explored between the ability to understand nonverbal metaphoric similarity and the ability to produce verbal metaphors to talk about that similarity. Subjects, 45 college students, were shown filmed scenes that depicted both metaphoric and literal similarity. Half of the scenes were of stationary objects and half of moving objects (events). In the latter case, for the metaphoric pairs, the same style of motion was used to link two unlike objects (a spinning ballerina and a spinning top). The subjects rated both the literal and the metaphoric pairs for the similarity, novelty, and comprehensibility of the pairing. They then wrote original metaphors as descriptions of the pairs and rated those metaphors for ease and quality of production. Results showed that the subjects rated the literal pairs as more similar, less novel, and more comprehensible than the metaphoric pairs of scenes. The intercorrelations of all ratings for metaphoric pairs showed that similarity, novelty, and comprehensibility correlated significantly with the ease of metaphor production, which in turn was correlated significantly with the rated quality of production. Similarity and novelty influenced the ease of apprehending the metaphoric relationship that underlies the descriptive metaphor. (FL)

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Cognitive Dimensions of Metaphor in Pictorial and Verbal Modes

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Running head: Cognitive dimensions of metaphor

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Cognitive Dimensions of Metaphor in Pictorial and Verbal Modes

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In this study we begin to delineate the connection between understanding nonverbal metaphoric similarity and producing verbal metaphors to talk about that similarity. To clarify a discussion of the interrelations of verbal and nonverbal aspects of metaphor, it is necessary to label the different component of verbal metaphors. The subject of the metaphor, what the statement is about, is called the tenor or topic. For example in "The moon is a kite suspended in black sky," "moon" is the topic. The term used metaphorically is called the vehicle (Richards, 1936). In this case the vehicle is the word "kite." The ground is the basis of the relationship between topic and vehicle. In this example, a small white object high in the sky from the point of view of the speaker.

Most of the psycholinguistic work on metaphor to date has focused on comprehension. Several investigators have shown that knowledge of abstract or general relations that are similar in the topic and vehicle domains is important in comprehending metaphor (Verbrugge and McCarrell, 1977; Malgady and Johnson, 1979; Tourangeau and Sternberg, 1981; Gentner, 1981).

This research leads to the question of what characteristics of the topic and vehicle domains lend themselves to the type of mapping that is involved in comprehending and producing metaphors. The similarity of meaning in topic and vehicle noun phrases has been found to be related to rated comprehensibility and goodness of poetic metaphors (Malgady & Johnson, 1979). Also, it has been shown that topic and vehicle terms which were dissimilar in that they referenced very different domains, but similar in their respective position within the domain related to aptness, but not comprehensibility

of metaphors (Tourangeau & Sternberg, 1981).

While these previous studies have added to our understanding of the role of similarity of word meaning in verbal metaphor comprehension, there remain questions of: 1) the difference between literal and metaphoric similarity, 2) the relationship of nonverbal similarity to verbal descriptions, and 3) the role of novelty as well as similarity in the ease of apprehending the ground of a metaphor and in the ease of producing a metaphor as a description. It is often pointed out that the combination of topic and vehicle domains in a metaphor is novel or unusual. This dimension, of novelty per se, has not been explored. If metaphoric combinations are less similar and more novel than literal cominbations perhaps the relationship between the two domains is not as obvious or immediately apprehended in metaphoric vs. literal combinations. This may be another important dimension, the ease of seeing a relationship between the two domains. Previous research has been based on derived measures which might relate to novelty and ease of apprehending metaphoric similarity but these dimensions have not been measured directly.

The method employed in the present study was to present films depicting both metaphoric and literal similarity, to obtain ratings of both types of similarity on dimensions relevant to metaphor, and to obtain verbal metaphors as descriptions of the similarity that were themselves rated for quality and ease of production. Half of the films were of stationary objects and half of moving objects (events). In the latter case, for the metaphoric pairs, the same style of motion linked two unlike objects. This manipulation has been shown to influence the form of metaphoric descriptions (Dent, 1981, Note 2). Specifically, vehicle words tend to reference action for Event pairs but not for Object pairs. The hypotheses were: 1) Metaphoric similarity would be rated less similar, more novel, and less comprehensible than Literal similarity, 2) Metaphors should be easy to write about depicted

metaphoric similarity but very difficult to write about depicted Literal similarity because there were not two domains involved, 3) similarity, novelty, and comprehensibility would correlate with ease and quality of producing a verbal metaphor, and 4) vehicle terms would reference action for Event metaphoric similarity but not for Object metaphoric similarity.

Method

Subjects

The participants were introductory psychology students who took part in the study for course credit. The participants were run in groups ranging in size from 11 to 19; a total of 46 students participated.

Stimulus materials

The stimuli consisted of ten triads of filmed scenes (see Table 1).

Insert Table 1 About Here

Within each triad three scenes were arranged with one above the other two. There was a Literal pair and a Metaphoric pair in each triad. For example, a Metaphoric pair was ballerina spinning and top spinning. In this pair one aspect, a style of motion is constant across two very unlike objects. The corresponding Literal pair was ballerina leaping and ballerina spinning. Across these two objects are many similarities of form. Half of the triads were of stationary objects (Object triads) and half were of moving objects (Event triads). A full description of the stimuli was given in Dent (Note 1).

Procedure

The experiment consisted of two phases. In one phase subjects rated pairs of filmed scenes for similarity, novelty and comprehensibility. In the other phase they produced metaphors as descriptions of the paired scenes and rated the metaphors for quality and ease of production. The order of the two phases was counterbalanced. A different random order of triads was used for the two different procedures. For both procedures subjects first viewed each triad and named each scene individually. This was done to

insure that the subjects be familiar with the full set of scenes and to allow a check on their perception of the scenes. The data from one subject who produced no intelligible metaphors were eliminated from the data set; the total number of subjects then was 45.

Rating procedure. Each subject was given a booklet that indicated which pairs of scenes to rate. The films were projected onto a large screen clearly visible to all participants. Each subject rated all triads, two pairs of scenes per triad, for one dimension--either similarity, novelty or comprehensibility--at a time. The order of dimensions to be rated was counterbalanced. All rating scales were six-point scales and the anchors were as follows: Similarity--very similar, very dissimilar; Novelty--very common, very unusual; Comprehensibility--very easy, very difficult. For similarity they rated "how similar or dissimilar the pair of scenes is;" for Novelty they rated "how unusual it is to pair the two scenes," and for comprehensibility they rated "how easy it is to see a relationship between the two scenes."

Describing procedure. Subjects worked in a booklet that indicated which pairs of scenes were to be described. Again the films were projected, one triad at a time, on a large screen. They were instructed to "make a metaphor about the two scenes." The instructions included a common sense definition of metaphor as "a type of verbal statement where two things are paired that are dissimilar in some ways, but the statement is not nonsensical." Also included were the following sample metaphors: her mind is a steel trap, the balloons are showering down, the trees are soldiers. The sample metaphors included both action and nonaction vehicles, and both concrete and abstract topics. The ease and quality of metaphor production were assessed in the following manner. After writing a metaphor it was rated for "how easy it was to make" and "how good it is" both on six-point

scales anchored with "very difficult to write--very easy to write" and "very poor quality--very good quality."

Results

The reliability of each of the five scales (measured on ten items) was computed using Cronbach's alpha. The reliability figures ranged from .79 to .87 and were computed separately for Literal and Metaphoric pairings (see Table 2). Each scale, for both Literal and Metaphoric pairings, was tested for additivity of items using the Tukey test and all scales passed the test, providing converging evidence with the reliability figures that summing over the ten items was warranted.

The Literal and Metaphoric pairings were compared for mean differences in ratings on the five scales (three for rating pairs of scenes and two for descriptive metaphors produced) using the dependent t-test and one-tailed probability. Literal pairs were rated more similar than Metaphoric ($t(44) = 3.54$, $p < .001$) less novel or unusual ($t(44) = 4.91$, $p < .001$) and easier to comprehend ($t(44) = 1.87$, $p < .03$). The sentences produced as descriptions of the pairings were rated easier to produce for Metaphoric pairs ($t(44) = -6.96$, $p < .01$) and of higher quality ($t(44) = -7.20$, $p < .001$). The same pattern of significant differences held for Object and Event items when these were analyzed separately.

The five ratings of metaphoric pairings were intercorrelated (using the mean of ten items) to determine the relationship of rated nonverbal qualities to rated verbal qualities. The intercorrelations are given in Table 3. The similarity, novelty, and comprehensibility ratings were all significantly related to each other. Ease and quality of production were significantly correlated. The correlations of novelty and comprehensibility with ease of production were significant. This overall pattern held true when Object and Event triads were considered separately, except that for

Event triads Novelty was not significantly related to ease of production ($r = .21$, $p < .08$, one tailed).

The sentences produced were scored for whether they were actually figurative using the definition that the statement was not literally true, but still made sense. Interscorer agreement was 95%. Table 4 gives the frequency of figurative statements for both Object and Event Metaphoric pairings. Over all subjects, the mean percent of total statements that were figurative was .86. Two further judgments were made. Figurative statements were judged to be relevant in the sense of including both central objects (agreement was 91%), and as either metaphor or simile (agreement was 95%). The average percentage of figurative statements that were relevant was .82. On the average, metaphors comprised 47% of the relevant figurative statements with the other relevant figures being similes. The mean percent of statements that were figurative but produced as descriptions of the Literal pairs was 20 and, on the average, 13% of the responses to literal pairs were nonsensical. In contrast, only one of the 369 figurative descriptions of metaphoric similarity was nonsensical.

The data from Metaphoric pairs on the ease of and quality of production ratings were correlated with the ratio of figurative to total statements and the ratio of relevant figurative to total figurative to determine whether statements judged to be actually figurative were rated relatively easy to produce and of high quality. This expected pattern was obtained (see Table 5). The same pattern of significant correlations was obtained for Object and Event triads analyzed separately. Neither production rating correlated significantly with the ratio of metaphor to relevant figurative statements.

For statements judged to be figurative, the vehicle term was categorized as referring to action or not. For example the metaphor 'the top

is dancing' contains an action vehicle while 'the top is a ballerina' does not. One of the model metaphors in the instructions to subjects contained an action vehicle. Action vehicles significantly more often occurred for Event than Object triads (dependent $t(44) = 11.07$, $p < .01$) even though all Metaphoric pairs could have been described with metaphors referencing two objects and no action. Object metaphors were rated easier to produce than Event metaphors (dependent $t(44) = -2.83$, $p < .001$) and of higher quality (dependent $t(44) = -2.58$, $p < .01$). The average rating for ease of production for metaphors with action vehicles was 4.06, for object vehicles it was 3.84. Quality was rated as equivalent for the two types of metaphors (Action -3.19; Object -3.18).

Discussion

Literal vs. metaphoric similarity

Instances of Literal and Metaphoric similarity presented pictorially were distinguishable on ratings of similarity, novelty, and comprehensibility. As predicted, Literal pairings of scenes were rated more similar, less novel and more comprehensible than Metaphoric pairings. Literal similarity exists between objects from the same domain. Metaphoric similarity is made up of a few basic similarities between objects that are essentially unlike (cf. Dent, 1981). Apprehending metaphoric similarity is necessary for the production of a verbal metaphor. The simple concrete Metaphoric pairs used in the present study were comprehensible to adults, although less so than Literal pairs, as predicted.

Perceiving and describing

Earlier work on the topic-vehicle interaction in metaphor, and the role of similarity in this interaction has laid the ground work for the present study on underlying dimensions of metaphor production. It seemed reasonable to posit that metaphoric juxtapositions of domains would have a certain degree of novelty or unusualness. These two aspects, similarity and novelty should be related such that more similar juxtapositions were also more common. These two interrelated factors should, in turn, effect

the ease of seeing a relationship between two unlike domains where the relationship between more similar, more common pairings should be more easily apprehended. Given that this is true, how do these dimensions relate to actual metaphor production? The present study found evidence for strong, if complex, patterns of relationship between characteristics of metaphoric pairings and the ease of producing a metaphor with the paired meanings. No direct relationship was found with the self-rated quality of production, although ease and quality were correlated. Novelty and similarity both influenced the ease of apprehending a relation between two unlike objects or events. This apprehension, in turn, formed the core of the ability to produce a metaphor. It seems that there was an optimal combination of some dissimilarity of two domains with commonness or familiarity of the juxtaposition that facilitated seeing a relationship between the domains. Once this relationship was apprehended, it was easy to produce a metaphor.

The present study involved relating apprehension of nonverbal metaphoric similarity to the production of metaphors. The finding that high quality metaphors were those that were easy to produce is consistent with the past findings (Tourangeau & Sternberg, 1981) that the ease of comprehending or interpreting a metaphor was positively related to the quality of the metaphor. They measured quality by combining ratings of how "good," "apt," "likable" and "interesting" the metaphor seemed. The relationship of similarity to quality and interpretability is not so clear-cut. Tourangeau & Sternberg found no relationship of their measures of similarity to the comprehensibility of the metaphors even though metaphors using topics and vehicles from similar domains should have been more difficult to comprehend. They would be more difficult because analogical metaphors require parallel relations in two domains that are very different in

content. When direct ratings of similarity (of topic and vehicle word meaning) were used a positive correlation was found with quality and comprehensibility of poetic metaphor (Johnson & Malgady, 1979). Quality was assessed by combining ratings of how "good," "pleasant" or "appropriate" the metaphor seemed. We found a direct relationship of similarity to the comprehensibility of nonverbal similarity and ease of production, and an indirect relationship to quality of production measured by asking directly how good the metaphor seemed. When the nonverbal similarity was relatively high (within the range of metaphoric as opposed to literal similarity) the relationship of two basically unlike objects was easy to apprehend and it was easy to write a metaphor as a description, which, in turn was of high quality. It may be that subjects use different criteria in judging the quality of their own metaphors than when judging metaphors written by others. The primary factor in judging their own metaphors seems to have been the ease of producing the metaphor, while in judging others' metaphors topic-vehicle similarity may have played a more direct role. Tourangeau & Sternberg (1981) found no relationship of overall similarity to aptness, but their similarity measure was derived from ratings of power/aggression and prestige rather than rated directly. Also, they used a particular form of metaphor which may have influenced the aptness rating. The metaphors they used were analogical in the sense that the vehicle was always a genitive phrase, 'the owl is the horse of birds' so that an object was explicitly placed in a category to which it did not belong literally. Not all metaphors can be translated into this form. That is, a metaphor of the 'A is B' form such as 'the moon is a kite' does not necessarily have the same meaning in an analogical form such as 'the moon is the kite of heavenly bodies.' Analogical metaphors seem to depend on between- and within-domain distance for their quality, but other kinds

of metaphors, such as the A is B type, depend on the overall similarity of the topic and vehicle objects as well as the novelty of the juxtaposition. The A is B form of metaphor, as in 'the ballerina is a top' does not specify an analogical relationship. Analogy, strictly speaking, is an equivalency or likeness of relations. Some metaphors are based on the invariance structure or style of change (see Dent, Note 1; Verbrugge, 1979) across two unlike objects, not on the relation of those objects to other members of their category or to the environments in which they tend to occur. Ballerinas and tops both spin and the spinning is the ground of the metaphor, not that tops are a certain kind of toy and ballerinas a certain kind of dancer. Some metaphors, therefore, are not analogical. In addition, analogies are not in and of themselves figurative since they merely assert the real similarity of two unlike domains. An analogy, thus, expresses a similarity that is a potential ground for an analogical metaphor. Metaphors direct the apprehension of resemblance without necessarily providing the ground (cf. Verbrugge, 1977).

In conclusion, dimensions of similarity and comprehensibility which have previously proven useful in characterizing verbal metaphor comprehension were shown to be important in characterizing nonverbal metaphoric similarity and in distinguishing it from literal similarity. These dimensions, along with the dimension of Novelty influenced the production of verbal metaphors. Both the similarity and novelty of topic vehicle pairs influenced the ease of apprehending the metaphoric relationship. This apprehension affected the ease of producing a descriptive verbal metaphor which, in turn, affected the quality of that metaphor.

Reference Notes

1. Dent, C. H. The developmental importance of motion information in perceiving and describing metaphoric similarity. Manuscript under review.

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Table 1

List of Stimulus Scenes

1	2	3
Sample Film Triads		
straight river, snow falling	curvy river snow blowing	curvy snake, confetti falling
Object Triads		
short building, smooth face, young lion, half moon	tall building, wrinkled face, proud lion, white moon	tall giraffe, wrinkled apple, proud king, white kite
Event Triads		
ballerina leaping, deer walking, car moving, hands clapping	ballerina spinning, deer leaping, car bucking, hands waving	top spinning, dancer leaping, horse bucking, wheat waving

Note. 1 & 2 = Literal pair; 2 & 3 = Metaphoric pair; 1 & 3 = Control pair.

Table 2

Scale Reliabilities (Cronbach's Alpha)

	Type of Rating				
	Similarity	Novelty	Comprehensibility	Ease of Production	Quality of Production
Type of Pairing					
Literal items	.79	.83	.87	.84	.82
Metaphoric items	.84	.83	.87	.86	.85

Table 3

Intercorrelation of Ratings of Nonverbal Metaphoric Similarity and of Descriptive Metaphors Produced

	Type of Rating				
	Similarity	Novelty	Comprehensibility	Ease of Production	Quality of Production
Similarity		.32*	.49**	.04	.0
Novelty			.67**	.25*	.01
Comprehensibility				.27*	.10
Ease of Production					.68**

Note: * = $p < .05$, one tailed

** = $p < .001$, one tailed

Table 4

Frequencies of Figurative Descriptions

	Type of Triad	
	Object	Event
Type of Description		
Figurative	186	183
Relevant Figurative	165	163
Metaphor (as opposed to simile)	85	84
Action Vehicle	13	119

Table 5

Correlations of Subject Ratings of Verbal

Metaphors and Independent Judgments of Metaphors

	Rating Score	
	Ease of Production	Quality of Production
Ratio Score		
Metaphor/Relevant Figurative	-.05	-.22
Relevant Figurative/ Figurative	.41***	.39**
Figurative/Total	.40***	.43***

Note: ** = $p < .01$

*** = $p < .005$